SUPPLEMENT

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Section II.—Surgery.

(Continued.)

GASTROPTOSIS, AETIOLOGY, DIAGNOSIS, TREATMENT.

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This condition, variously called gastroptosis, ptosis of the stomach, dropping of the stomach or slipped stomach, may be part and parcel of a more or less generalized *descensus* of all the abdominal viscera, a condition first associated with the name of Glenard, or it may involve the stomach and transverse colon in the main. In this paper I am concerned only with the latter class of prolapse and the material from which the paper has largely been prepared has been drawn from a consideration of the case notes of forty-seven patients seen during the past few years, in whom the condition has been definitely recognized. While admitting that the number of cases is not large, the point I wish to plead in justification is that the subject has received but scanty notice in even the best of our text books. However, the importance and frequency of gastric prolapse are now more widely appreciated, especially since radiography has come to our assistance in this as in so many other abdominal conditions.

The Normal Position of the Stomach

What is the normal position of the stomach and how is it so maintained? It is rather difficult to answer the first part of the question except in general terms, as one must realize after seeing many stomach skiagrams and exploring many abdominal cavaties that what is the normal position of one person's stomach may not precisely be that occupied by the next normal stomach examined. As Stiller points out in persons who possess a narrow epigastric angle the stomach occupies a lower plane than in persons who possess a broad angle. In these the organ tends to lie at a higher plane. It may be said as a generalization that the stomach normally occupies the left hypochondriac, the left half of the epigastric and the upper part of the left umbilical divisions of the abdomen with the pylorus extending across the mid-line to enter the right epigastric and umbilical regions (see Figure I.).

But while it is customary to fix such limits as the above to the position of the stomach, it must be borne in mind that we are dealing with a hollow muscular organ which is constantly undergoing movement in more than one direction, being filled and emptied, changing slightly its position as its owner assumes the erect or supine position. Hence the exact position of even a normal stomach varies within fairly wide limits in the living subject.

Apart from the question of contents, its position is also influenced by the condition of neighbouring organs, the

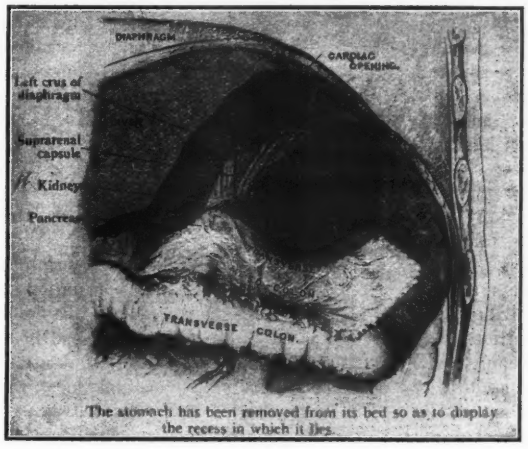

Figure I.

presence of tumours and especially by the condition of tonus of the musculature of the abdominal wall. To these features I shall presently refer.

The factors which individually and collectively maintain the healthy stomach in its normal position are as follows.

(i.) The lesser omentum which extends from the transverse fissure of the liver to the lesser curvature of the stomach.

The constant drag upon this structure by a low and heavy stomach explains no doubt the dull aching pain these patients when erect complain of in the region of the left costal margin and below the left nipple from stretching of the involved fibres of the coeliac plexus of nerves.

(ii.) The fixation of the gullet to the edges of the diaphragmatic opening through which it enters the abdomen.

(iii.) The hollowed-out bed in which the stomach lies. This bed is a most important factor and consists of the gastric surface of the spleen, the left suprarenal capsule, the upper portion of the left kidney, the upper surface of the pancreas and the transverse colon and mesocolon.

(iv.) The tonicity of the musculature of the abdominal wall especially of the recti muscles. It is easy to see that if, when the subject stands erect, the muscles are toneless from overstretching or from interference with their nerve supply, the stomach is allowed to move forward from its snug bed so as to clear the projection of the pancreas, its downward movement is greatly facilitated.

(v.) Gastric tonus. This determines the ability of the stomach to adapt itself to its contents at any given moment. It is obvious therefore that apart from congenital malposition the stomach can acquire a position lower than normal only by a defect in one or more of the factors just enumerated.

It is generally conceded that a stomach is definitely prolapsed if the greater curvature passes 2.5 centimetres or more below the horizontal plane of the umbilicus, provided, of course, that the vertical measurement of the organ between the curvatures is not increased. This excludes cases where the stomach is merely dilated and the greater curvature lies low while the level of the lesser is unchanged. It is usually taught in text books that females suffer more frequently than males in the proportion of four to one, but radiology has shown us more recently that the proportion is about three to one.

The Aetiology of Gastroptosis

Many conditions have been blamed and amongst them the following:

(i.) Tight lacing of corsets, especially if of unsuitable shape and laced from above downward, (ii.) occupations involving prolonged standing, (iii.) fasting during the middle portion of the day with the taking of a heavy meal in the evening, (iv.) repeated child-bearing or recurrent attacks of ascites, (v.) the residuum of an exhausting illness, such as enteric fever, (vi.) the drag of adhesions between the free edge of the greater omentum and some pelvic structure, (vii.) violence of a jarring nature often repeated, for instance jumping upon the heels, (viii.) a high fixation of the first part of the duodenum causing angulation between the first and second parts and thus leading to dilatation and ptosis of the stomach. The condition may be due possibly to a congenitally long mesogastrium.

Of all these causes I would place first in importance relaxation or loss of tone of the abdominal musculature, especially of the recti, however produced. This factor would appear to explain the comparative frequency of gastroptosis as well as of movable kidney in women who have borne several children in rapid succession.

Gastroptosis is also frequently found in young persons, usually females, who present also pronounced neurasthenic symptoms. I am not alone in regarding this type of neurasthenia as an effect of the stomach displacement. I firmly believe that in many cases neurasthenia is wrongly labelled as a disease when it is but a symptom of some definite condition the correction of which will often promptly and effectively cure the so-called neurasthenia. How often has one seen reposition of a prolapsed and retroverted uterus rid an unfortunate woman of her condition of "nerves" after she has swallowed pints of "tonics," bromide mixtures, and the like! In young, nulliparous women the wearing of unsuitably laced corsets is no doubt a definite ætiological factor, especially if there exists as before mentioned a congenital tendency.

Symptomatology.

Especially when it is part of the picture of a generalized visceroptosis, prolapse of the stomach is almost self evident. Viewed laterally the patient is seen to present a bulging of the lower part of the abdomen with recession of the epigastric area (see Figure II.).

FIGURE II.

This appearance is accentuated by taking a full meal or by the distention of the stomach by gas. Splashing sounds are easily elicited if the patient takes a glass of fluid. There is usually a complaint of fullness in the lower portion of the abdomen and a sense of dragging chiefly felt below the left breast and about the left costal margin. These unpleasant symptoms almost immediately disappear if the patient lies down. A frequent and important symptom is loss of appetite, due to food retention in the stomach. Constipation is a frequent complaint and may be distressingly severe. Many of these patients become very thin and highly nervous. It must, however, be remembered that gastroptosis may exist without causing any very noticeable symptoms. In the so-called virginal type the symptoms are more evident as a rule and the clinical picture is coloured by certain nervous manifestations.

It must not be assumed that all cases of gastroptosis lend themselves to easy diagnosis. The medical attendant while fully seized with the advisability of a bismuth meal examination of a doubtful stomach condition may not have the means or occasion for applying the same at hand. How then can he arrive at a diagnosis? He has to rely largely upon a careful history of the case. From this he will gather that vomiting if present is not a very pro-

minent symptom, that lying down has always been followed by considerable relief to the patient, that examination will reveal that the anterior abdominal walls are flaccid and toneless, that in the vertical position the main protuberance of the belly is below the navel and that if with the stomach empty the patient while standing drinks a full glass of water, the fluid can immediately be heard and percussed well below the umbilicus. It naturally follows that the transverse colon, being indirectly attached to the greater curvature of the stomach through the gastro-colic omentum, may precede the stomach in its descent, thus stretching the transverse meso-colon. This is probably the explanation of the very low, even pelvic position of some colons in persons with gastroptosis.

I have observed that when this condition exists, an annoying and pronounced symptom may be irritability of the bladder which is probably due to pressure of the gas-laden colon on the postero-superior aspect of the organ. This symptom too is worse in the standing position and may disappear in the recumbent state. My case notes

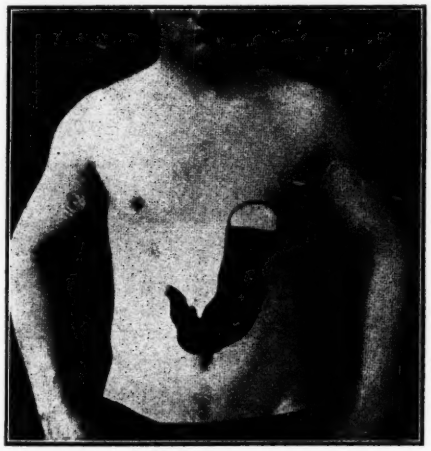

FIGURE III.

show that this symptom was complained of by four patients in whom a pelvic lie of the transverse colon was detected in the skiagram as opposed to the normal position which is at or just below the level of the umbilicus.

Another annoying symptom from which these patients may suffer is borborygmi. When the transverse colon is found to occupy a pelvic position, it acts as a gas trap by pulling upon and increasing the acuteness of the angles at the hepatic and splenic flexures. This, no doubt, is the explanation of the obstinate constipation which so frequently accompanies gastroptosis. In many cases the pylorus does not move down to the same extent as the curvature of the stomach with the consequence that in the erect position the prepyloric region appears as an almost vertical tube leading up to the duodenum.

To push its contents vertically up hill requires increased effort on the part of the stomach musculature. As this, often weakened by dilatation, is supplied in part from the sympathetic nervous system through the cœliac plexus, is it not a fair assumption that the impulses which are continually passing to the central nervous system, are the cause of the symptomatic neurasthenia from which so many of these patients suffer?

The Radiographic Appearances of the Prolapsed Stomach.

Figure III. illustrates a typical fish-hook form of stomach, normal in position as well as in every other respect. A glance at Figures IV. and V. which were taken from patients with typical gastroptosis of fairly severe degree shows certain change which may be briefly summed up as follows:

The gas bubble is not oval, appears ill defined and vertically elongated. In some cases owing to a degree of incompetency of the cardiac sphincter it is quite absent. The two curvatures of the stomach lie well below the normal level for each, but the intermediate height of the stomach in the absence of pyloric or duodenal obstruction and consequent gastric dilatation remains normal. The

FIGURE IV.

normal incisuræ tend to be obliterated and the contour of the curvatures appears to be smoothed out as it were, probably from loss of tone of the gastric musculature. The pylorus may be moved to the left especially in the curled up type of stomach and often it occupies a lower position than normally.

The time of emptying of the stomach is usually considerably prolonged and some residue of the meal may be seen up to six or seven hours after ingestion. It is well to note that the patient should be examined before the screen in the vertical position and also that in the recumbent position the organs should be manipulated upwards to ascertain whether the displacement is caused by adhesions fixing the great omentum in the pelvis or to the anterior abdominal wall low down.

In the absence of radiological evidence errors in diagnosis will largely be avoided if the points already men-

tioned are kept in mind, namely the comparative absence of vomiting (particularly of blood), the relief afforded by a recumbent position and the low position taken up by swallowed fluids in a subject whose abdominal profile shows a bulge below the umbilicus.

The Treatment of Gastroptosis.

Of my forty-seven patients thirty-eight were females and of these twelve had borne children. The youngest was eighteen years, the oldest seventy-seven years. In twelve the symptoms were so slight and the degree of prolapse so small that no treatment beyond care in diet and sleeping with foot of bed raised was advised.

In the next group (eighteen patients) treatment consisted in dieting, sleeping with the foot of the bed raised and the wearing, while out of bed, of a suitable abdominal support. In thirteen the stomach was only moderately prolapsed and in five the stomach was badly prolapsed.

Of the remaining seventeen patients (the last group) who were considered suitable cases for operation three refused surgical attention and were lost sight of. Of the fourteen who went to operation three were subjected to the procedure described by Beyea (gastropexy) and eleven to a modification of Rovsing's operation which I have been in the habit of performing as follows.

The abdomen is opened through the left rectus by a long incision two-thirds above and one-third below the umbilicus and a general inspection made of the abdominal contents. The stomach is drawn up into position so that the greater curvature will lie just above the level of the umbilicus. Three long moderately fine strands of kangaroo tendon are taken for the suturing. The first needle with a cutting edge enters the abdominal wall six centimetres above the navel and at the outer edge of the left rectus. Having passed through the abdominal wall, the cutting needle is replaced by the non-cutting one which is passed through the wall of the stomach well towards the cardiac end and just below the lesser curvature. It carries the tendon in and out of the sero-muscular coat several times parallel to the lesser curvature, finally emerging well away from the pylorus. The cutting needle again takes the place of the non-cutting one and carries the tendon through the entire thickness of the abdominal wall about the transverse centre of the right rectus muscle. The needle again enters the abdominal wall 1.25 centimetres below its point of emergence. The non-cutting needle is again substituted and the suture carried in and out of the stomach wall, parallel to and slightly below its previous line. Once more the cutting needle is resumed and the tendon finally made to emerge through the left rectus just below its original point of entry. Both free ends of the tendon are now caught up in a pressure forceps.

The same procedure is carried out with the other two strands of tendon, so that finally we have six strands passing transversely through the stomach wall, the uppermost just below the lesser curvature, the lowermost well above the greater curvature. Care has, of course, to be exercised to avoid the gastric vessels in placing the sutures.

The peritoneal aspect of the stomach within the area delimited by the sutures is lightly scarified with the point of the scalpel and gently painted with tincture of iodine.

The peritoneum is then sutured and in turn the other layers are united. A small gauze pad squeezed out of spirit is now placed under each loop of tendon and the free ends are tied in pairs over similar pads on the left rectus. This method has, in my opinion, two advantages. It leaves the original line of incision free for examination and removal of marginal sutures on the tenth day. There is less danger of the tendon cutting out of the stomach wall than in the method described in the text books. The patient is then confined to bed for four weeks during the first three of which the foot of the bed is kept raised on blocks. I regard this as an essential step.

After this operation it is not unusual to find a febrile rise to 37.8° C. or 38.3° C. (100° F. or 101° F.) for a couple of days due probably to the peritoneal irritation set up by the iodine. As a matter of fact the tendon sutures need not be removed, but simply cut across while the skin is being pushed down over the point of emergence. This I do usually about the twentieth day.

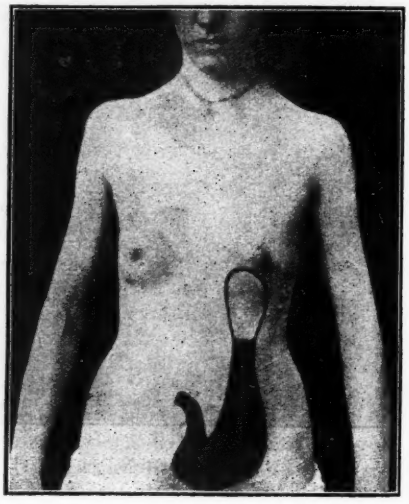

FIGURE V.

I have had excellent results from this method of operation and of the eleven patients so treated eight have been cured or immensely relieved of their symptoms and three have benefited. Of the three who were treated by plication of the lesser omentum and lesser curvature one has apparently been cured, one has been relieved, but the third quickly relapsed and has received no benefit and so far I have not been able to impress upon him the advantage of my modification of the Rovsing operation.

It is difficult to tabulate the final results except in a general way. Of the fourteen who were subjected to operation, ten have been seen subsequently and the majority of these are quite or comparatively free of their symptoms. In some this operation has been too recent for me to be sure of the permanency of the cure.

Prevention of Gastroptosis.

Before concluding I would like to make a few remarks regarding the prevention of gastric prolapse and the association of appendix lesions with that condition. Many young women and some young men who work in offices and factories are anæmic. This anæmia, because it is often associated with loss of muscle tone, especially in a tropical climate like North Queensland, is possibly a factor contributing to gastroptosis and should, of course, be corrected by iron, arsenic and exercise. Again, many young women partly from considerations of vanity will persist in wearing corsets which are quite unsuitable, especially if laced from above while the person is standing. Almost every day one sees a hundred centimetre bust forcibly squeezed into a ninety centimetre corset, much to the eventual disadvantage of the stomach and kidneys. Again and this I regard as an important point, one should impress upon young women whose work compels them to spend the better part of the day indoors, in office or factory, the danger that may arise from eating little or nothing at lunch time and of partaking of a heavy meal in the evening. So many patients have given this history that it must be more than a mere coincidence in the ætiology of prolapse of the stomach.

With regard to the type of abdominal support most useful in gastroptosis a special type of corset as made by a well-known firm of corset makers in Brisbane or an abdominal belt pure and simple may be used. In either case an anterior pad is necessary. This should be of Gamgee tissue or of felt covered with chamois leather, semicircular in shape and thicker along the upper than the lower edge. Provision must be made by suitable straps and suspenders against the belt shifting up or down. The pad should not be permanently fastened to the belt or corset until the position of the greater curvature of the stomach has been determined. The belt should be applied while the patient is lying down on an inclined plane; it must be laced up from below and should be worn during the time the patient is on her feet and be at all times comfortably tight. It is to be remembered that an abdominal support does not act merely by pushing in below and supporting the stomach on a projection of the anterior abdominal wall, as it were, but, by raising the intra-abdominal pressure, it helps to maintain the organ in its normal bed because as has already been pointed out the stomach cannot descend until it emerges from the recess in which it normally lodges.

The last point to which I wish to refer is the possible association of lesions of the appendix with prolapse of the stomach. I regard this as more than a coincidence. I would like to assure you that I am not one of those surgical cranks who regards every appendix as diseased. I regret to say that my notes are not quite clear upon the exact frequency of appendix lesions with gastroptosis, but I have certainly seen the associated conditions fairly often. It is possible that the low grade of dynamic obstruction set up in the ascending colon by the dropping of the transverse colon may set up fæcal stasis in the appendix and that this in turn may lead to chronic inflammatory changes in the wall of the latter organ.

Where the appendix has been obviously diseased, I have not hesitated to remove it, if necessary, through a separate incision.

In conclusion I have to gratefully express my indebtedness to Drs. L. J. Spence and Val. McDowall, of Brisbane, for the excellent radiographic work they have done for me.

ARTHRITIS DEFORMANS FROM THE ORTHOPAEDIC STANDPOINT.

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The increasing vogue of specialism, great though the sum total of its ultimate advantages to the patient may be, undeniably bears with it the drawback of a tendency to concentrate the treatment of any particular case along the lines that lie within the province of whatever specialist the patient may first chance to consult. We all profess to believe in the necessity for the cooperation of the exponents of the different branches of medicine where a case presents several aspects, but our professions are not always translated into action. *Arthritis deformans* is preeminently a disease which presents many different aspects as regards its management; the physician, the pathologist, the dental surgeon, and the orthopædic surgeon may be all required to take a hand in its treatment.

It seems to me that in the past this disease has been too exclusively regarded as a medical one; too little regard has been paid to the point of view of ultimate function; deformity has been allowed to occur or when already present has not been corrected.

It is of little avail to cure the disease if a sequela of deformation is left over to prevent adequate functional use of the joints. It must never be forgotten that these are diseased joints and that therefore they tend to deform and that they require rest and protection.

It is with the view of emphasizing the orthopædic treatment of these cases that this article has been compiled. I do not propose therefore to enter into a discussion of the pathology or ætiology of the condition, but mainly to confine myself to a consideration of the treatment.

Pathologically the disease is classified into two main types. They are the hypertrophic type called osteo-arthritis and the atrophic type called rheumatoid arthritis and the orthopædic treatment of both types has much in common.

In both types of the disease fixed deformities of the joints are very prone to develope, causing great impairment of function. Seldom is the limitation of movement or the fixed deformity due to the actual mechanical obstruction of an osteophytic outgrowth; commonly it is the result of contracture of ligaments, joint capsule, muscles or tendons. At an early stage of the disease we find joint movement limited by protective muscle spasm which later becomes crystallized into deformity as the result of secondary contracture.

The management of these patients must be conducted

along various lines. In the first place there is the discovery and if possible the elimination of any septic focus in the body. In the second place there is the preparation and administration of an auto-genous vaccine consisting of the infecting organism. The third element is the dietetic, hygienic and medicinal treatment. Lastly local treatment and protection of the affected joints are required.

What concerns us particularly at the moment is the fourth aspect, namely the local treatment and protection of the affected joints. It too frequently happens that the unfortunate victims of this disease on consulting their medical attendant are given a bottle of sodium salicylate and advised to go to a masseuse and have some hot air and massage. If they are a little more fortunate, their septic focus is sought for and removed and a vaccine administered. It is regrettable that it is but rarely that the case is considered from an orthopædic stand-point and an effort made to preserve or restore the functions of the joints. It seems to be regarded as a natural sequence of events that the sufferers from this disease should acquire deformed and stiffened joints.

A joint the subject of *arthritis deformans* is a diseased joint and every diseased joint requires rest. The muscle spasm which is invariably present in these cases, shows us that Nature is making an attempt to immobilize the joint; the unconscious muscle spasm is protective in origin just as it is in tuberculosis and it is our duty to assist Nature in her protective efforts and not to subject the inflamed joint to the insult of forced and painful movements.

The fixation need not be so absolute as in tuberculous disease. Any slight degree of movement that is allowed, must, however, be within the limits of pain. Movement that causes pain, is invariably harmful. Even though a slight degree of movement be allowed, no weight-bearing on the affected joint must be permitted in the active stage.

There used to be a belief prevalent that immobilization of such joints favoured ankylosis or at least caused limitation of movement, but clinical experience entirely negatives this view. It is common to find that immediately the retentive apparatus is removed, the range of movement is distinctly greater than it was before the joint was immobilized. There is, however, a small group of patients in whom, do what you will, the disease goes on to a close fibrous or even bony ankylosis; if this is going to happen, the sooner it occurs the better; the patient will gladly exchange his few degrees of painful movement for a firm ankylosis, for then his pain will cease. In such cases it is better to immobilize his joints in good position and to allow ankylosis to occur, rather than to let Nature ankylose the joint in a bad position that may subsequently require operative correction.

Our next consideration is the prevention and correction of deformity, preferably the former. Only too often deformity is well established before the patient comes under treatment. Each individual joint has a deformed attitude which it usually tends to assume in the presence of disease; this attitude is tolerably constant no matter what the particular disease may be. Thus the shoulder falls into adduction, the hip into flexion and adduction, the knee into flexion with a subluxation of the head of the tibia into the popliteal space; the wrist becomes flexed, the ankle drops into the *equinus* position. Being thus forewarned of the individual vicious attitudes that each joint is apt to take up, when splinting from the preventive stand-point we fix the joint in the position opposed to this deformity. Thus we fix the hip in abduction and extension with a little external rotation, the knee in full extension, the foot at right angles to the leg. The attitudes Nature tends to fix the joints in are without exception inimical to good function.

When these patients are not seen till deformity has been allowed to develope in the lower extremity, we must realize that the condition is made worse and in truth many of the symptoms are directly due to weight-bearing in the deformed attitude. Particularly is this true of weight-bearing on a flexed, adducted hip. The mere correction of the deformities without other measures will bring about a great amelioration of symptoms. Again there is a large group of cases in which the disease may be regarded as having burnt itself out, leaving behind it a heritage of deformed and crippled joints, the patients frequently being bed-ridden. These are the most pleasing of all conditions to handle, for when the deformities are corrected, the patients can be made to walk and to regain a fair amount of activity.

In general the method of gradual correction by the continuous application of a small degree of force should be employed to overcome deformities. In some joints the mechanical difficulties occasionally demand correction under anæsthesia. Thus the adduction of the hip can sometimes only be overcome by forcible movement under an anæsthetic aided by tenotomy of the adductors. But remember that this forcible movement to correct deformity is a very different thing to repeated forced movement by a masseur, which physicians of an older school frequently prescribed in the mistaken belief that it would prevent stiffness. Indeed this forcible movement is invariably followed by a reaction and a temporary lessening in the range of movement and must often be followed for a time by complete fixation in the corrected position.

It is not sufficient to eliminate the focus of septic absorbtion without correcting the deformed attitude of joints, for even though the active process be thus arrested, the mere existence of deformity in a joint of the lower limb with its attendant sequel of improper weight-bearing implies a constant trauma to the joint and constant trauma alone is sufficient to produce the changes of osteo-arthritis. One frequently sees such changes in the knee and ankle joints, when malunion of a fractured femur has resulted in interference with the proper alignment of the joints. Again osteo-arthritic changes in the knee joint commonly result from the trauma of repeated displacements of the internal semilunar cartilage. It therefore behoves us, when dealing with a joint already the subject of osteo-arthritic changes, to protect it from the trauma of weight-bearing in a deformed attitude.

As regards the operative treatment of the disease there is a very distinct though limited field. The removal of individual osteophytes on account of their effect in producing mechanical obstruction to movement needs to be approached with great caution. It is rarely that the hindrance to movement can with certainty be attributed to one or two individual osteophytes. In those rare cases in which such is the case, their removal is certainly indicated and the results are eminently satisfactory.

The greatest field for operative treatment is in the non-articular osteo-arthritis of the hip of the aged, sometimes called *morbus coxae senilis*. The history of these cases is fairly typical and constant. First a gradual and insidious onset of stiffness in the joint, so gradual that the patient can seldom state when it began; indeed at first it passes almost unnoticed. After stiffness comes deformity. The hip gradually becomes flexed and adducted often to a tremendous degree; as a result the patient complains that his leg is getting shorter. Thirdly in point of time but first to him in order of importance comes pain; in many cases this is intense. He can get no comfort or rest by day or by night. He can neither sit, stand nor lie in any one position for long, but is constantly and restlessly moving about in search of ease. But few of them seek advice before the symptom of pain appears. Usually by this time deformity is well established and examination shows that the hip possesses a very few degrees of intensely painful movement. It is the exception for these conditions to go on to spontaneous firm ankylosis. If such does occur, the patients lose their pain, which is attributable to the presence of movement in the diseased joint. In many of them the pain is so intense that they are willing to submit to any surgical procedure and to run any risk to obtain relief.

Two operations have a definite place in the surgical treatment of this affection. A third, namely excision of the head and neck of the femur is too likely to cause death from shock, especially as it is to be remembered that these subjects are old and usually also suffering from arterio-sclerosis.

The operation I have been accustomed to perform is arthrodesis of the hip as introduced by Albee. Age is no contra-indication; I have done it on a man of seventy. Fat is an absolute contra-indication, not because of the greater technical difficulties of the operation, but because these fat patients would probably die of hypostatic pneumonia, as they have to be kept recumbent for eight weeks. The patients on whom I have operated, have never given me a moment's anxiety and there has been very little post-operative shock.

The other operation is Jones's pseudo-arthrosis which consists of exsection of the neck leaving the head *in situ*. A piece of the great trochanter with its muscular attachments intact is chiselled off and then nailed to the proximal stump of the neck so as to insure a pseudo-arthrosis. The rationale of this operation is the removal of weight-bearing and motion from the affected joint. Jones speaks highly of the results and it has the advantage that it can be done on fat patients as no prolonged period of immobilization is necessary.

I am firmly convinced that the time has come for the profession to abandon its pessimistic prognosis in *arthritis deformans*. The vast majority of these patients if seen reasonably early are eminently curable with the retention of good function, but only if the disease be attacked from every front simultaneously. To allow the occurrence of deformity in the affected joints should be regarded as a serious reproach to those concerned; when it is already present, it should be immediately and persistently attacked.

STRUCTURE AND FUNCTIONS OF THE ILEO-CAECAL VALVE.

By A. H. Rutherford, M.D. (Edinburgh),
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Appearances During Life.

In May, 1905, I had under my observation a patient who had an artificial anus in the colon eight centimetres long. Through this aperture in the colon the ileo-caecal orifice was sometimes seen. Ordinarily covered by loose folds of mucous membrane, the ileo-caecal orifice would discharge faeces without being seen. Occasionally, when peristalsis was more active than usual or when the interior of the caecum was irrigated by warm water, a papilla about 1.8 centimetres in diameter and projecting about one centimetre from the wall of the caecum could be seen. The mucous membrane covering the papillary eminence was of a redness in appearance of the inside of the lips, smooth and glistening, without folds. The eminence was smooth, scarlet, tense and rounded, with a dimpled orifice at the summit, in appearance resembling half a scarlet cherry; whereas, the wall of the colon and caecum was thrown into folds which ended abruptly at the circumference of the papilla. There was an orifice in the centre of the papilla, from which vibrating radiating corrugations ran out for about six millimetres. These corrugations would disappear, as described later. The method of appearance of this papillary eminence was as follows.

When peristalsis was sluggish, the papilla remained hidden under the folds of mucous membrane and the fluid fæces welled up from the colon and *caput caecum coli*. When peristalsis was active, the papilla emerged from the folds of mucous membrane, shifting its position by a series of rhythmical movements; each successive movement produced its displacement of the papilla, both in longitudinal, transverse and antero-posterior direction of an oscillating nature. At the same time the papilla seemed to trace a series of sigmoid curves upward. In the course of this displacement the papilla was upward succeeded by lateral sigmoid movements at the same time advancing and receding from the artificial anus. When the papilla reached the height of its excursion, it remained for about one second and then slowly collapsed into the *caput caecum coli*. The rhythmical undulating movements of the papilla were of a peculiar sinuous nature, as might be those of a snake whose head was fixed in cotton sheeting; and the darting out jets of semi-fluid fæces to be described later resembled the projection of the tongue of the reptile. The area of the papilla would be seen to enlarge at regular and rhythmical intervals, becoming at the same time less prominent. *Pari passu* with the enlargement of the papilla the papilla opened, apparently by relaxation of the circular muscular fibres, and semi-fluid fæces, about three and a half cubic centimetres, were observed to emerge from the opening with a force varying with the peristalsis. The movements observed appeared to represent the termination of the peristaltic wave projected along the small intestine. The rhythmical ejection of semi-fluid fæces was accompanied by a vigorous contraction of the ileum behind the area of the papilla which relaxed to allow of ejection of semi-fluid fæces, after which ejection

its prominence and firmness increased as the orifice closed. During excitement the rate of these discharges was about every second or if the excitement was less, about every two seconds. At the time of this discharge the corrugations about the opening in the centre of the papilla disappeared.

While peristalsis was moderate, the orifice of the papilla opened sluggishly and the fæces were discharged sluggishly, but while peristalsis was active the papilla opened quickly and the fæces were ejected in jets, after which the papilla closed again smartly. At times flatus escaped, the papilla opening to allow its passage or fluid mixed with flatus. The sphincter action was, however, perfectly in control and allowed nothing to pass without relaxation, not even flatus.

The exercise of the functions described above caused no sensation to the patient. The papilla was firm and elastic to touch, like a rubber ball, two or three centimetres in diameter, tender, especially when the finger or instrument was placed on the aperture in the centre of the papilla. Under light ether anæsthesia in abdominal operations, I have found the same rubber-ball sensation, two to three centimetres in diameter, at the junction of the ileum with the large intestine, where the anæsthesia has not been sufficient to cause relaxation of the ileo-caecal valve. On endeavouring to pass the finger or a No. 12 English catheter through the orifice, the sensation was similar to trying to dilate the anus, an elastic resistance yielding somewhat and then recoiling. But in the case of the ileo-caecal valve no instrument could be passed through the orifice on account of tenderness.

Under deep anæsthesia (with chloroform) the firm elastic mass altered and the dimpled orifice relaxed. Instead of a mass there was a slit-like orifice two and a half centimetres long, through which the index and middle fingers together were readily passed. The circular muscular fibres could be felt as thickened bands at the margin of the orifice. There was no appearance of projecting flaps of mucous membrane, the edges of the slit being almost flush with the mucous membrane of the caecum.

Peristalsis.

Two sorts of peristalsis were noticed: one, the ordinary vermicular type in which the muscular wall of the caecum and colon contracted in waves from below upwards; the second form was more complex. It is with diffidence that I mention the following, as I only observed it once. Mention is made of it, however, because of its possible bearing on what follows. In the region of the colon wall roughly six centimetres from the papilla four small dimples appeared on observation, the force causing them originating in the muscular layer of the caecum. These four dimples formed the corners of a rhomboidal figure if they were connected by lines. The dimples were roughly four centimetres apart. Immediately these four appeared, there was a twitch and the four corners approached as if by the contraction of a muscle connecting them acting like a purse-string. This immediately relaxed and the depressions at the corners disappeared. As probably connected with or dependent upon this class of peristalsis, it should be mentioned that, while the interior of the caecum was being observed during the period that the valvular papilla was not visible, a pencil of firm fæces about seven and a half millimetres in diameter and six centimetres in length was one day seen to be pressed out of an apparent round orifice in the wall of the caecum. This was pressed out with considerable force in a direction at right angles to the surface of the bowel, evidently moulded by the circular aperture through which it emerged. After the fæcal mass had been extruded, no orifice, however, could be discovered and the spot from which it had come, had the same appearance as the rest of the intestine. The Nurse in charge told me she frequently observed this appearance in different positions of the colon and it had no relation to the site of the ileo-caecal orifice, but was noticeable in an area near the rectum. No inspissated fæcal masses were ever noticed coming from the *caput caecum coli*, only semi-fluid fæces similar to that coming through the ileo-caecal orifice. Through the upper end of the artificial anus formed fæces could be observed lying in the ascending colon and made up of lobulated inspissated portions resembling in appearance fæces passed per anus.

Consideration of Thirty-two Fresh Post Mortem Specimens.

Thirty-two fresh *post mortem* specimens were obtained at the Sydney Morgue at various times after death. Speaking generally, those obtained shortly after death in cold weather and placed into formaldehyde solution very closely resembled the ileo-caecal valve as described in life. Those obtained after twenty-four hours or less in hot weather, tended to resemble less in appearance that as described in life and approached more nearly those described as "normal" in the text-books, that is a valve, an upper and lower lip and frenula.

Microscopical Appearances.

A vertical microscopical section of No. 11 specimen obtained *post mortem* was taken. This specimen most closely resembled the appearance as described during life, *id est* there was a circular papilla or mammilla about 1.8 centimetres in diameter and about one centimetre high and no frenula were present.

Briefly, the microscopical appearances showed that both the circular coat of the ileum and the circular coat of the caecum and colon entered into the formation of the sphincter and between the two the longitudinal coats of the ileum, colon or caecum passed to the summit of the ileo-caecal valve. As well there was a third muscular coat or reduplication of the external circular layer of the valve mammilla, the three circular coats constituting a sphincter of considerable strength.

The description is necessarily very brief and further information is given in my book on the ileo-caecal valve, published by Lewis, of London.

Appearance in the Dog.

The ileo-caecal valve was removed from two dogs immediately after death by shooting. The two specimens obtained closely resembled that described in the human subject.

Surgical Considerations.

The function of the ileo-caecal valve is that of a sphincter and is similar to that of the pylorus and of the internal anal sphincter. In its action it is twofold: (i.) To regulate the flow of semi-fluid fæces through the valve

(ii.) to prevent regurgitation. In cases of intussusception the swallowing action of the ileo-caecal valve can be easily understood on account of the foregoing description. As long as peristalsis lasts and the ileo-caecal valve is active in function, the intussuscipiens would tend to be drawn further and further through the ileo-caecal valve, whereas chloroform would tend to relax the fibres of the ileo-caecal valve and make reduction more easy. In the case of the diverticula which take up the semi-fluid fæces from the colon, and after having inspissated them, press them out as pencils of fæces as described previously. Inflammation is apt to close up the openings of the diverticula and lead to secondary inflammatory masses round about the colon.

Enemata.

Douching the interior of the caecum with hot water at once increased peristalsis of the large, but more strongly of the small intestine. The increase was most evident when the ileo-caecal orifice was irrigated.

AN ACCOUNT OF CASES OF ENLARGED GLANDS OF THE GROIN WHICH OCCURRED ON BOARD H.M.A.S. "MELBOURNE" IN THE WEST INDIES BETWEEN JANUARY 1, 1915, AND DECEMBER 31, 1915.

By Wm. J. Carr, B.A., B.C. (Cantab.), M.R.C.S., L.R.C.P.,
Surgeon Lieutenant-Commander, Royal Australian Navy.

His Majesty's Australian Ship *Melbourne* arrived in West Indian waters in December, 1914, and during the whole of the following year cruised around the West Indian Islands, with the exception of a month spent off the American coast. Her complement was 436 officers and ship's company.

We first came in contact with the enlargement of the glands of the groin accompanied by symptoms which appear to differentiate the condition from the ordinary symptomatic bubo in February. We were two days out of Kingston, Jamaica, and cruising off the Cuban coast at the time. Between February 3 and 6 eight patients were admitted to the sick bay with similar clinical features. All had swellings in either one or both groins which enlarged slowly until they attained the size of a hen's egg and showed no signs of breaking down. The skin was not affected and the glands felt semi-elastic. In all cases the horizontal set of inguinal glands were those affected. The constitutional symptoms were extremely severe, the patient complained of intense headache and giddiness which came on gradually and were noticed while the swelling in the groin was quite small. He looked dull and heavy; his face was very flushed and his tongue dirty. He had no gastric symptoms. There was no sign of a rash or enlargement of spleen or other glands. The pulse was slow and full and its rate was 50 to 60. The temperature was between 38.3° C. and 39.4° C. (101° F. and 103° F.) on admission and remained raised for two or three weeks with morning remissions and then gradually subsided. The patient was not prostrated in any way and beyond the intense headache which was constant, did not appear to be very ill. One or two cases had well marked nervous symptoms, were anxious and restless and unable to sleep. In about three days their appetites returned and even with a temperature of 39° C. they would crave for ordinary solid food.

At first these cases caused considerable alarm as plague is endemic in this part of the world, but the absence of prostration and the fact that we had not touched at any infected port reassured us; we came to the conclusion that we had to deal with the condition which has been called climatic bubo.

On examining these eight patients for a possible cause of the condition we found that one had a septic mosquito bite on the right knee, two had gonorrhœa, another gonorrhœal warts, two had small chafes on the penis which healed in a day or two, one developed a chancroid four days after admission and one had no apparent source of infection at all. In seven out of the eight cases there appeared to be a definite source of infection, yet the epidemic nature of the disease, the intensity of the headache and the great enlargement of the glands with very little tendency to form pus and break down, forced us to the conclusion that they were not buboes secondary to chancroids or septic foci, but that there were other factors producing the peculiar features which characterize the condition. Later on the majority of our patients had no obvious source of infection such as appeared in the first batch. At first we treated these cases as infectious, but they are not so. All appeared after leaving a port and none appeared during the long period at sea. All these first patients except one were landed on our return to Kingston and were absent for three months before they were fit for duty again. One resolved in three weeks; this patient was the one with no obvious source of infection.

No further cases occurred till April, when we had two. In May we had five, then none till August when we had a further epidemic of eleven cases after a stay in the Island of St. Lucia. The remainder of the cases occurred in batches during September, October and November, always occurring after a visit to a port especially Kingston or St. Lucia. In all patients except one the glands affected were the inguinal glands and nearly always the horizontal set, the exception was a steward. In this man the first glands involved were the deep glands along the external iliac artery and the condition was taken for an appendix abscess. He was operated on ashore and a large mass of glands found. Later on the inguinal glands became enlarged. This case cleared up well; no cause was found to account for the condition.

Literature.

On examining the literature on the subject, we found that this particular type of bubo occurring in tropical climates has been noticed by many observers but that little is known as to its cause. It was first described by a German naval surgeon named Ruge in 1896 who described a series of cases occurring in a German squadron off the Zanzibar coast. It has been described as occurring in East Africa, West Indies, Strait Settlements, China, Mauritius, Madagascar, Chili, Ceylon, Bengal, Papua and Sicily. Cantlie regards it as a form of *pestis minor*, De Sueur as a manifestation of malaria, Selem as secondary to intestinal infection and Castellani as a disease *per se*. The last named divides it into three varieties, acute, subacute and chronic. As regards treatment, he advises expectant treatment with excision of the glands in the chronic form. The following ointment is also recommended:

Plumbi iodidi	1.9 grammes
Potassii iodidi	1.9 grammes
Vaseleni	*ad* 30 grammes

Gray, in *The Clinical Medical Journal* of May 13, 1912, stated: "That sufficient cases have been found in which there is no evidence of venereal disease, past or present, to warrant the belief that in climatic bubo we have a separate specific disease. That it is not due to malaria or septic absorption and that neither iodides, arsenic, quinine or salvarsan are of any use," and advised extirpation.

In regard to our patients during 1915 we had fifty-one with enlarged glands of the groin. Of these seventeen had obvious primary causes, such as chancroid and septic foci, and can be omitted from consideration. Of the remaining thirty-four in whom the condition clinically resembled climatic bubo, twenty had apparently no sign of a source of infection.

Of the remaining fourteen one had an inflamed mosquito bite, five had small abrasions on the genitals, two had gonorrhœa, one had *tinea marginatus*, one had a septic foot, one had an abrasion on the knee and three had a rash which looked like scabies, but was apparently not as we could not find the *Acarus scabiei*. In two the rash was on the scrotum, the other on the thighs.

Of these thirty-four buboes, eighteen resolved without incision. The remainder were incised and a small amount of pus evacuated. Of the fifteen which resolved, in thirteen we could find no primary cause.

Treatment.

The first series were treated by expectant treatment and incision when the buboes began to break down. We tried potassium, iodide, quinine, mercury ointments with little benefit. An incision usually evacuated a minute quantity of pus and the resulting wound refused to heal and left a discharging sinus which lasted two or three months and then only healed when the patient was removed to a cool climate. In one case in which excision was tried, the resulting wound broke down and refused to heal. The ointment of iodide of lead appeared to benefit two patients. In August we began to use "Salol" in 0.6 gramme doses every four hours; the result in my opinion was very striking. The headaches which were such an evident feature of the disease and which benefited little from phenacetin, caffeine and "Aspirin," disappeared almost at once and the general condition of the patient improved whilst the swelling of the glands subsided in some cases after two days' treatment. Out of the fifteen patients in whom the condition resolved, eleven had treatment with "Salol."

Bacteriology.

Smears of the pus examined contained a streptococcus and a bacillus resembling Ducrot's bacillus. Not being an expert bacteriologist I do not suppose my researches in this direction were of much value.

Conclusions.

The conclusions arrived at from consideration of our cases are as follows.

1. There appears to be a definite type of disease in which an inguinal bubo is associated with a high pyrexia which occurs in epidemic form and for which in many cases no cause can be found.

2. It occurs only in tropical or sub-tropical climates and only among bodies of men kept in close proximity or confinement on board ships or in barracks.

3. It is probably not of venereal origin, although in our patients it is practically impossible to exclude the risk of infection. In these patients a penile sac occurred a week after the glands became enlarged.

4. It is not infectious or contagious.

5. It is non-fatal and quickly clears up in a cold climate.

6. Iodides, quinine, arsenic are of no value. The best remedy is "Salol" in repeated doses. Locally the plaster of lead iodide and potassium iodide is recommended.

7. The superficial inguinal glands are those affected in almost every case.

8. It appeared about five to ten days after leaving port, especially the ports of Kingston, Jamaica and Port Castries, St. Lucia. Both these ports were badly infected with venereal disease.

9. The theory I have formed as to the condition is that the primary source of infection is from a minute abrasion of the genital organs, so small as to escape notice in many cases. This does not of necessity label the cases as venereal.

The reasons I would put forward are as follows: (i.) The fact that the same glands are always infected. No other glands were infected in our patients, except in one in whom the glands alongside the external iliac were involved. (ii.). It nearly always occurred after leaving the port where opportunities for this condition to occur were frequent. In most of our patients in whom there was an obvious source of infection, that source was the genitalia.

Probably the epidemic character and the symptoms which distinguished it from the ordinary symptomatic bubo are due to diminished powers of resistance in men crowded together in a tropical climate and living largely on tinned or refrigerated food. This might explain why an intestinal antiseptic such as "Salol" was beneficial as it certainly was in many of our patients.

The best method of treatment is the removal to a cool climate, complete rest, fresh food, intestinal antiseptics, such as "Salol" and locally lead iodide plaster, and incision only if absolutely necessary.

THE RELATION OF THE INFERIOR THYREOID ARTERY TO THE RECURRENT NERVE.

By C. H. C. Searby, B.Sc., M.B., M.S. (Melbourne),
Anatomy School, University of Melbourne.

Many detailed accounts have been written of the relation of the recurrent laryngeal nerve to the inferior thyreoid artery, but these have been mainly from the purely anatomical standpoint. Dwight (1) described the frequency with which the nerve passed "behind" or "in front of" the artery; Streckeisen (2) and Taguchi (3) paid particular attention to the looping of the artery and the latter has published a very instructive series of diagrams. Gleitsman (4) and others have also worked on similar lines.

An attempt is made here to treat the matter from the point of view of the surgery of the thyreoid and is based

on the results of examination of the arteries and nerves in twenty-four dissecting-room subjects.

The results of the investigation enable a classification to be given demonstrating the varying types of relations between the artery and the nerve; and while no attempt is made to suggest any methods whereby injury to the nerve can be avoided, it is possible to demonstrate the frequency with which the nerve is exposed to such injury.

The Gland.

As seen in dissecting room subjects the gland is best described as having three surfaces and three borders. The surfaces are antero-lateral, medial and posterior (posterior-lateral would at times be a better description). It is of interest to record that the relations of the posterior surface varied considerably according to the size of the gland, shape of the neck and relative sizes of the structures within the neck, whereas the relations of the other two surfaces were more constant. The borders are anterior, posterior and lateral.

The Artery.

The inferior thyreoid artery ascends in relation with the antero-medial border of the *scalenus anterior* for a variable distance and then inclines backwards and medially with an upward curve and passes behind the thyreoid. It then curves downwards and in the terminal part of this portion of its course it lies on the *longus colli* muscle at the side of the œsophagus. The artery then changes its direction and turns forward to reach the thyreoid gland in the region of the posterior border. Having reached the gland, the artery generally divides (after a short course on the posterior surface) into two main branches, one passing upwards in the region of the posterior border and the other laterally towards the lower pole.

For the purposes of this paper it is proposed to call that part of the artery which extends as far as the lateral aspect of the œsophagus the first part, the short part passing forwards from the *longus colli* to the posterior border of the gland the second part and the remaining portion the third part.

The Nerve.

On the right side the direction of the recurrent laryngeal nerve in all cases examined was practically in a straight line from its origin to the lower border of the inferior constrictor with a slight inward curve. Thus it is incorrect to describe the nerve on the right side as ascending in the interval between the trachea and the œsophagus. On the left side on account of its lower origin the nerve can and usually in the neck it does run in the interval between the trachea and the œsophagus. Before entering the larynx, the nerve sometimes divides and in the last part of its course usually runs parallel with and often very close to the ascending branch of the artery.

The height which the artery reached in its loop, varied considerably; the level at which the artery entered the gland, also varied. The second part of the artery was often very short; the arrangement of the branches of the artery on the posterior surface of the gland differed somewhat in different cases.

The Gland and Fascia.

Between the posterior surface of the gland and the prevertebral muscles there appears to be a condensation of fascia; with care many layers can be separated by blunt dissection. The nerve ascends amongst these layers. The artery pierces some to reach the gland substance.

In some cases the gland could be lifted easily from the muscles at the back of it, in other cases only after blunt dissection of the layers. Sometimes the nerve was lifted with the gland, at other times it remained behind.

It is the peculiar course of the artery passing as it does to the posterior border of the gland and not entering the lateral border which enables the gland to be dislocated in so many instances; in all such cases the first part of the artery remains fixed to the muscles in the greater part of its extent by fascia. That is, the gland during dislocation is pivoted at first on its posterior border and the second part of the artery acts as a hinge. Further dislocation lifts the extreme medial portion of the first of the artery and thus lengthens as it were the second part of the artery.

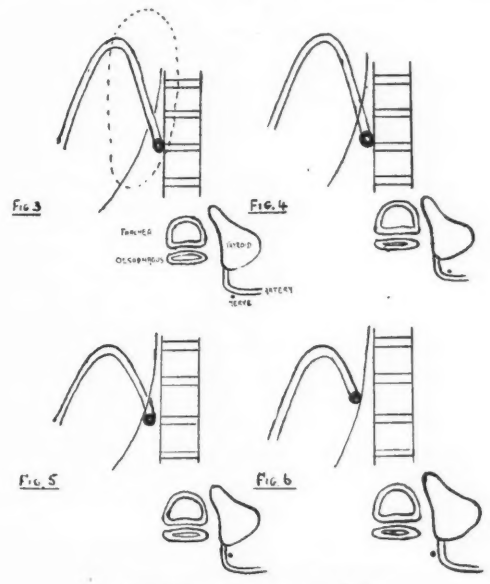
Relations of the Nerve.

The angle at which the nerve on the right side approached the mid-line, depended on the size and shape of the neck.

The relation of the nerve to the gland was dependent also upon the size and shape of the neck and structures therein, including the gland.

In general the nerve on the right side was a posterior relation of some part at least of the gland and the nerve on the left side was more usually a relation of the medial surface of the left lobe.

Dependent upon the above factors the nerve was a direct relation of one or more of the first, second or third parts of the artery and it was only by considering the relations in this way that an accurate description was possible. As observed previously, dislocation of the gland



FIGURES III., IV., V. and VI.

Diagrams of the artery and nerve, with sections through the trachea at level of second part of the artery. NOTE:—The angle between the nerve and trachea is exaggerated. In the sections the length of the second part of the artery is exaggerated.

sometimes resulted in the nerve being lifted with it, at other times the nerve remained behind. In the former type of case the nerve was a direct relation of the third part of the artery, that is the nerve passed among the branches of the artery on the back of the gland. Then again there were certain cases in which the nerve was either an anterior relation of the first part of the artery (Figure IV.) or a lateral relation of the second part (Figure V.) and yet remained behind when the gland was lifted; but here the nerve could be angulated by dislocation of the gland. And lastly there were cases where the nerve was either a posterior relation of the first part of the artery (Figure III.) or a medial relation of the second part (Figure VI.) and in these cases the nerve remained bound to the prevertebral muscles as stated and even extreme dislocation did not move the nerve.

Classification of Types of Relations.

A classification of the relations between the nerve and the artery based on these considerations is as follows:

CLASS A.—The nerve is a direct relation of the third part of the artery (Figure VII.).

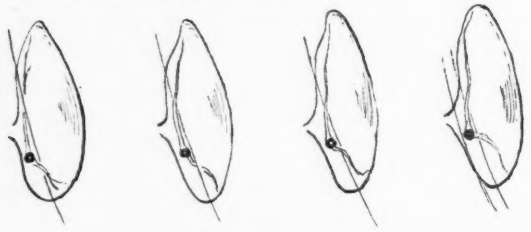


FIGURE VII.

Diagrams of the posterior surface of the right lobe showing nerve in relation with the third part of the artery. (As in previous figures the inclination of the nerve is exaggerated.)

CLASS B.—The nerve is an anterior relation of the first part of the artery or a lateral relation of the second part (Figure V.), but owing to the condensation of fascia between the gland and the muscles at the back, not a "direct" relation of the third part of the artery.

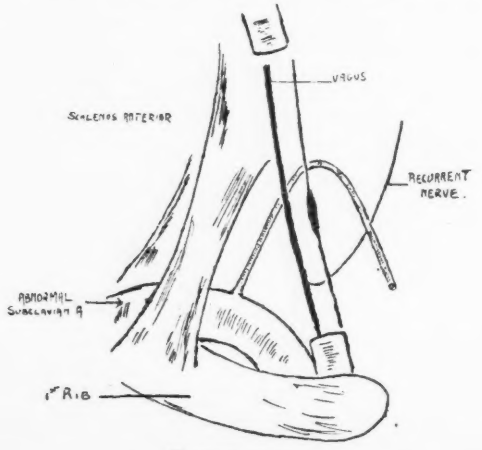


FIGURE VIII.

Diagram of abnormal subclavian artery. Recurrent nerve passing from vagus towards trachea. (Drawn from a photograph.)

CLASS C.—The nerve is a posterior relation of the first part of the artery (Figure III.) or a medial relation of the second part of the artery (Figure VI.) and again not a "direct" relation of the third part.

The surgical importance of these groups is evident. In Class A the nerve must be very liable to injury during the clamping of vessels and in these cases complete removal of the lobe of the thyreoid without injury to the nerve must be very difficult, a point referred to recently by Parsons (5).

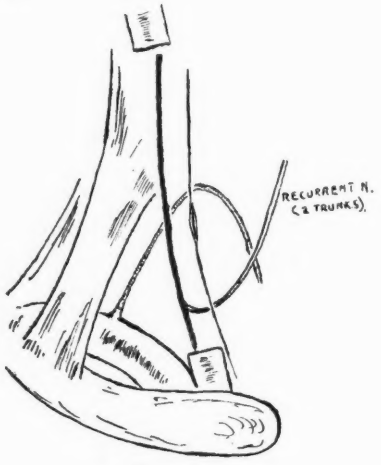


FIGURE IX.

Diagram of abnormal subclavian artery. Recurrent nerve in the form of two trunks and a direct anterior relation of the artery. (Drawn from a photograph.)

In Class B the nerve may be angulated over the artery and this angulation may be quite marked if an enlarged lobe is dislocated during operation.

In Class C the nerve is for all practical purposes immune from injury.

Summary of Results.

Cases with Abnormal Right Subclavian Artery.

In three cases the right subclavian artery was a branch of the arch of the aorta. In all these cases the *scalenus anterior* and the vagus were more lateral than usual. As was to be expected, the recurrent nerve did not hook under the abnormal subclavian, but passed direct from the vagus (Figures VIII. and IX.) and on account of its more lateral origin the angle of approach was greater than usual.

In two of these cases the nerve was a posterior relation of the first part of the artery (Figure VIII.) *id est* in Class C.

In the other case the nerve was in the form of two branches and was an anterior relation of the first part of the artery (Figure IX.) *id est* in Class B. Strangely enough in this case the right lobe of the thyreoid happened to be very large and dislocation of the lower pole caused acute angulation of the nerve.

Remaining Cases.

For the whole twenty-four cases, using the classification given above, the figures are shown in Table I.

Nerve	Class		
	A	B	C
Right	6 cases (25%)	4 cases (17%)	14 cases (58%)
Left	4 cases (17%)	3 cases (12%)	17 cases (70%)
Both (in the same body)	0 cases (0%)	2 cases (8%)	12 cases (50%)

Conclusions.

Division of the inferior thyreoid artery into three parts enables a more accurate description to be given of the relation of the recurrent laryngeal nerve to the artery from the surgical standpoint. The nerve may be a relation of one or more parts of the artery. According to the position of the nerve it may be classed as very liable to injury, liable to angulation over the artery or practically immune to injury.

In 50% of the bodies examined the nerves on both sides of the neck were in the position where they were, for all practical purposes quite safe from injury during thyreoidectomy, while in no cases in this series were both nerves in what may be called the dangerous position, but there is a definite percentage of cases (8% in this series) where both nerves are liable to temporary injury by angulation over the artery during dislocation of the gland during thyreoidectomy.

References.

(1) I. Dwight, "The Relations of the Inferior Thyreoid Artery and the Recurrent Laryngeal Nerve," *Anatomischer Anzeiger*, 1886, *Seite* 204.

(2) A. Streckeisen, "Beiträge zur Morphologie der Schildrüse," *Virchow's Archiv*, 1886, *Band* ciii.

(3) K. Taguchi, "Die Lage des Nervus recurrens Vagi zur Arteria thyreoidea inferior," *Archiv für Anatomie, Abteilung I.*, 1889, *Seite* 309.

(4) A. Gleitsman, quoted by E. S. Judd, in "Mayo Clinics," 1920, Volume XII., page 582.

(5) F. G. Parsons, "Notes on the Recurrent Laryngeal Nerves," *Journal of Anatomy*, 1920, Volume LIV., page 174.

Section III.—Gynaecology and Obstetrics.

MODERN OBSTETRICS.

Dr. J. A. Cameron (Ipswich), the President of the Section, gave an address dealing with every day obstetrics, more especially from a general practitioner's standpoint. He invited discussion in order that the members of the Section might contribute something towards the problem of the maintenance of the ideal and assist obstetricians of the rank and file in improving their midwifery work. The results of hospital work were compared with those of private practitioners in a review of three thousand consecutive confinements personally attended in the patients' own homes with the aid of a very uncertain trained assistant. This work was classified under four headings. They were: maternal mortality and morbidity, maternal disability, fœtal mortality and infantile crippling.

Interesting statistics were quoted showing that there had been practically no diminution of the death rate during the last seventy years. One mother in every two hundred died at her confinement and from 3% to 5% of full time infants were stillborn. One abortion or premature birth occurred in every five full time births and 10% of the mothers received some lesion.

The preventive measures to lessen the present maternal and infantile mortality and disability of child-birth necessitated four things from the point of view of the woman. In the first place there was need for better ante-natal instruction and care. In the second place well trained medical assistance was essential. The third requirement was better nursing and after attention, while the last demand was that better conditions should be provided for the woman in labour.

He referred to the maternity scheme now before the Queensland Government, which was the first serious attempt on a large scale in the Commonwealth to attack the problem of improving the maternity results. He pleaded for adequate organization with regard to hospitals, students, doctors, post-graduate courses, fees, help to resident doctors, the registration and inspection of small maternity homes, the supply of well-trained nurses and some extension of the bush nursing scheme. He also advocated improved training for doctors and nurses. In regard to practice he demanded careful supervision during the whole pregnancy and the whole period of labour, with the application of principles of surgical cleanliness and the elimination of hasty work. Lastly he desired to see the establishment of laboratories and all facilities to further research work.

Surgical Conditions Resulting from Labour.

Dr. T. G. Wilson (Adelaide), read a paper on surgical conditions resulting from labour. Surgical interference at the time of labour would be prevented if the relative size of the passages to the passenger were more closely investigated in every instance before the onset of labour. X-rays had been suggested as being a great help in this direction. Consideration was given to the state of affairs in which disproportion occurred and the best methods of delivery were discussed. These included the induction of premature labour and Cæsarean section. Mutilating opertions should be extremely rare. The great frequency of occipito-posterior positions as a cause for difficulty in parturition was mentioned. The limitation of vaginal and rectal examinations should be practised; the author had practically discarded rectal examination.

Pituitary extract should be used with a considerable degree of circumspection. The relative size and position of the passenger in regard to the passages must be known before it was given especially to primiparæ. In regard to forceps the pendulum was swinging back to their restricted use in normal labour. Dr. Wilson was convinced that the use of forceps in unsuitable cases and especially when applied too early was responsible for the frequent occurrence of perineal lacerations and over-stretching of the genital supports. This resulted later on in various degrees of *prolapsus uteri*, cystocele and rectocele and so on.

Tears of cervix frequently healed spontaneously and unless hæmorrhage occurred, no attempt should be made to suture them at the time of labour. All tears of the perineum should be stitched at the time of labour, preferably before delivery of the placenta, when the field was clear of blood. Rupture of the uterus and concealed accidental hæmorrhage might warrant surgical interference.

Cæsarean section for eclampsia was rarely called for and the outlook for the mother was much better with expectant and eliminative treatment. He had but a limited experience of symphyseotomy and pubiotomy. The surgical procedures necessary in the case of sepsis immediately following confinement were discussed. Prophylaxis was the keynote of the situation. Conservatism in regard to curettage where there was septic absorption was recommended and exploration of the cavity with a gloved finger and swabbing with "Izol" were advocated. He also mentioned facilitation of free drainage, elevation of the bed, hot vaginal douches and small doses of pituitary, ergot and strychnine.

In speaking of retroversion of the uterus as a result of parturition he pointed out that a practice was made of an examination of all patients six weeks after confinement and in the great majority of cases a cure could be effected without surgical interference by postural treatment, the temporary use of pessaries, exercises or any measures tending to keep the uterus forward until involution was complete.

Dr. G. Rothwell Adam said that he had listened with much pleasure to Dr. Wilson's paper. It was a timely effort for in recent times obstetric mortality had been much under discussion rather to the neglect of the morbidity aspect.

Statistical records of obstetric mortality were easily obtainable and gave a firm basis for its discussion, but the incidence of obstetric morbidity was not on so sure a footing. There would appear to be three reasons for this. (1) The symptoms that resulted from the traumatism did not appear for months or possibly for years after the delivery or even after several subsequent pregnancies. (2) Failure on the part of the medical attendant to appreciate the involutionary period, its physiology and pathology. (3) The tendency to separate obstetric and gynaecology, instead of making them complementary.

He could not discuss all the points raised by Dr. Wilson, but he wished to refer briefly to one aspect of the causes of obstetric morbidity, namely the minor degrees of sepsis occurring during the puerperium. On looking over his case books he had noticed two things. The frequent use of forceps in primiparae and the frequency of febrile recovery with fœtor of the lochia or more or less severe hæmorrhage were significant of an infection.

So mild were the symptoms that they were attributed to some mammary disturbance, but subsequent events apparently showed that the involution of the pelvic contents had been interfered with. The arrest of the involution of the uterus and its appendages was of the first importance as the starting point of various well-known gynaecological ailments. It was necessary to visualize the pelvic contents as a whole with a common vascular and lymphatic supply, for in this manner a clear conception was obtained of the various parts open to invasion by septic organisms. Moreover it offered an explanation of how the minor infections were a causative factor in the general pelvic symptoms common to the various gynaecological lesions.

The resort to efforts of rapid delivery either by forceps or pituitrin before the parturient canal was duly prepared caused more or less serious injuries. But they formed portals for infection often leading to a lymphangitis which could be traced into the sacro-uterine and broad ligaments as distinct bands and thickened areas.

There was no acute inflammation with the formation of a protective barrier, but an insidious absorption of the products of infection which doubtless resulted in the chronic ill-health of such women. Many other instances of the ravages resulting from the minor puerperal infections might be cited as bringing about disablement or at all events inefficiency in the child-bearing women at an important period of her life.

The problem of the morbidity of child-birth lay not only in a closer study of the puerperium, a better understanding of the physiology and pathology of the puerperal involution, but in watching carefully Nature's own preparations for delivery and not making hasty efforts to terminate the delivery. In order that these conditions could be carried out efficiently obstetric practice must be reformed and placed on a more satisfactory and economic basis. These factors were complementary.

Dr. Fourness Barrington pointed out that a large head was as much a cause of dystocia as a small pelvis. Prophylactic induction of labour in such circumstances was of great service. He fully agreed regarding the inadvisability of Cæsarean section in eclampsia and thought that it was very rarely needed.

He condemned ventro-suspension or ventro-fixation in women who could become pregnant, and mentioned a recent experience in which Cæsarean section had to be carried out after such a procedure in a single woman. He favoured an examination of the pelvis on the tenth day of the puerperium. If the uterus were retrodisplaced, it should be replaced and kept in position by a suitable pessary. Much trouble followed mild sepsis and retrodisplacements were often due to faulty involution of the uterus and its ligaments from this cause.

Dr. W. T. Chenhall said that the ideal treatment of tears of the cervix was immediate repair, the advantages of which outweighed the disadvantages. Immediate repair was imperative in the presence of hæmorrhage. Careful aseptic repair diminished the risk of sepsis and closure of raw surfaces lessened the risk of auto-infection. The essentials for success in the operation were good table equipment and full exposure in a good light. The instruments required were a speculum, two double volsella, a needle holder and round curved needles. Great advantage was to be gained from the use of absorbable sutures. It was necessary to remember the proximity of the ureters, bladder and rectum.

The ideal treatment of an injured vaginal outlet was immediate repair; hæmorrhage and laceration of the *sphincter ani* allowed of no choice. Operation should never be undertaken until it was certain that the uterus was satisfactorily contracted. The advantages of immediate repair were that it checked bleeding and lessened the risk of sepsis, that the approximation and coaptation of tissues was more easy and more certain and that primary union was more certain. The repair of the sphincter made for greater comfort and less danger of sepsis.

The speaker then discussed in detail the various steps in the operation for repair of injured vaginal outlet.

Dr. J. C. Windeyer said that he had found it of great interest to observe that Dr. Cameron had estimated that contracted pelvis occurred in about one in every hundred private patients in Australia. They did not meet major degrees of contraction frequently in Australia, but the minor degrees were common and in his experience contraction in the transverse diameter of the outlet was not sufficiently recognized as a cause of difficult labour. He would also like to assure Dr. Cameron that the practical instruction of students was improving quite appreciably in Australia and would be still further advanced when overcrowding in the medical schools ceased as it was promising to do.

With reference to Dr. Wilson's remarks on rectal examination Dr. Windeyer said that he always taught that rectal examination should be used in normal patients in whom it was desired merely to estimate the size of the cervix, and he was sorry to learn that Dr. Wilson had ceased to use that method of examination in normal women. In the abnormal, of course, vaginal examination had to be employed.

Dr. Ralph Worrall said that greater use should be made of still-born infants and prepared pelves in teaching. In examinations there should be stricter marking of answers to such vitally important questions as "indications for forceps" *et cetera*. Occipito-posterior positions should be discovered beforehand and corrected by external palpation prior to labour and by combined external and internal palpation during labour. Pituitary gland extract should be used with great caution and was contra-indicated in the presence of probable degeneration of muscle, such as was common in multiparæ, just as digitalis was contra-indicated in degeneration of cardiac muscle.

He considered the dorsal position the best for obstetrical work. Episiotomy was useful in primiparæ to prevent the strain on the uro-genital triangle and subsequent cystocele and loss of control over the bladder sphincter.

Vesico-vaginal fistulæ were frequently the result of a delayed second stage in former days, but they more often arose in recent times from the application of forceps before the cervix was fully dilated; tears which extended into the bladder were the result. In inversion of the uterus not a moment should be lost in attempting to re-invert, as a loss of time of a very few hours might make the manœuvre impossible. In chronic inversion he had successfully used posterior hysterotomy combined with abdominal section. Cellulitis frequently occurred without perimetritis; the former often followed an infected tear, while the latter was usually a lymphatic infection; cellulitis more frequently ended in complete recovery with restoration of tubal function.

He did not think that it was wise or necessary to make an internal examination to ascertain the position of the uterus before the tenth day of the puerperium. The uterus did not become a pelvic organ before that day. He usually examined on the fourteenth day; if a retro-displacement were found, he treated the condition by posture until the twenty-first day and then inserted a pessary until involution had been completed about the end of the sixth or seventh week. He had no other use for a pessary than at this time.

Successful midwifery could not be conducted without patience and this could not be exercised unless the doctor were adequately remunerated for the time devoted to his patient.

Dr. A. Norman McArthur said that he particularly wished to address a few remarks to the operation of Cæsarean section. It was an operation which was of very great utility in carefully considered cases. But he was quite certain that there was a wave of Cæsareanism passing over the State with more "small Cæsars" roaming about than there should be. The little midwifery he now practised was brought to him as a refuge in the hope that he would provide an escape from the Cæsarean section threatened by others. In the last three instances the children had been born without forceps although the mothers had been told that Cæsarean section was necessary. In cases where there existed obstruction to labour in the form of fibroids in the true pelvis, Cæsarean section was obviated by the performance of myomectomy at the fourth or fifth month of pregnancy.

Vesico-vaginal fistula had been formerly a bugbear to him, but he was experiencing little difficulty in repairing the fistula by the two-way method.

Dr. A. J. Gibson referred to the advantages gained by using the anterior shoulder according to Dr. Windeyer's teaching in the recognition of occipito-posterior positions and as a guide to the descent of the head. The preventive treatment of occipito-posterior positions by means of pad and binder at the thirty-seventh week according to the method of Buist was of great value. He laid emphasis on the necessity for examining more than once in order to be sure that the normal position was retained until the head had sunk into the pelvis.

Early rupture of membranes in the case of a vertex presentation in the normal pelvis seemed to suggest an occipito-posterior position.

The abdominal binder was of great value in aiding the uterus to act in a proper direction in women with pendulous abdomen and obliquity of the uterus; by this simple means long tedious labours and the unnecessary use of forceps and "Pituitrin" might sometimes be prevented.

He was in agreement with Dr. Wilson with regard to the indiscriminate use of "Pituitrin;" if this drug were employed 0.18 mils, was sufficient to restore normal uterine function.

Retroversion was aided by too forcible expression of the placenta and unskilful massage of the uterus after it had descended into the pelvis. He advised examination on the tenth day and the use of posture rather than the pessary.

THE ANATOMY OF PROCIDENTIA UTERI.

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Introduction.

The condition described as prolapse is one which is comparatively common in gynæcological clinics. The great majority of cases seen are of the first or second degree. Cases showing prolapse in the third degree are not so common, while the condition known as *procidentia uteri* or complete prolapse is rare. It is rarer still that a specimen of this condition comes to one for dissection and when such a specimen was found in a subject in the Department of Anatomy at Sydney University it was thought to be suitable for special investigation.

Description of the Specimen.

The specimen is one of complete *procidentia* which was found in a subject in the Department of Anatomy, Sydney University. As far as could be ascertained the subject was about seventy years of age and had had the condition for over twenty years. She had suffered severely in late years from hæmorrhage from the genitals. No further history could be obtained.

The pelvis is well developed, the measurements being:

Inter-spinous	235 millimetres
Inter-cristal	250 millimetres
Inter-trochanteric	260 millimetres

There is a complete prolapse of the uterus, the vagina being completely extroverted. The surface of the vagina

shows some ulceration. The external *os uteri* is at the apex of the protruding mass. The mass of the *procidentia* descends to 172 millimetres below the crest of the pubes and the mass itself measures 122 millimetres from the anterior end of the vulvar cleft to the lowest point of the mass. The diameter of the mass at the widest point is 71 millimetres.

Method of Dissection.

The pelvis was removed and frozen. It was then sawn in sagittal sections (see Figure I.). A median sagittal

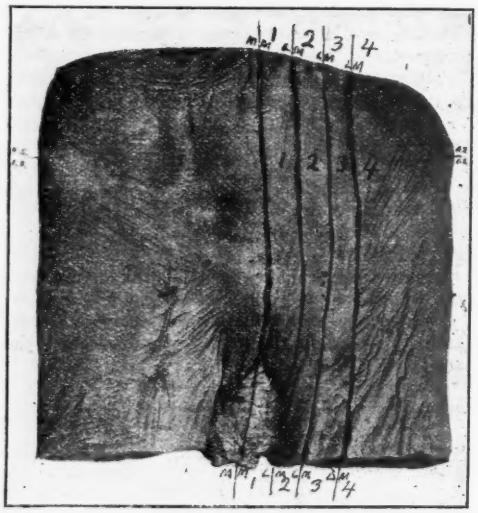

FIGURE I.

Pelvis of a subject aetatis seventy years with a complete prolapse—procidentia uteri. The protruding mass is 172 millimetres below the crest of the pubes and 122 millimetres below the vulvar cleft. It is 71 millimetres wide at its widest part. The pelvis was frozen and cut in sagittal sections along the lines shown. The right half was dissected from the median sagittal plane (see Figures II., III., IV., V.). The left half was sectioned. The thicknesses were as follows: Number I., 23 millimetres; number II., 25 millimetres; number III., 18 millimetres. The medial surfaces of sections I., II., III. and IV. are shown in Figures VI., VII., VIII. and IX. of the series.

section was cut and the right half was kept intact. A dissection was made of the pelvic wall in this specimen from the medial aspect (see Figures II., III., IV. and V.). The left half of the specimen was sawn in sagittal sections which were intended to be each twenty-five millimetres in thickness. But a little variation occurred and the thickness of the sections was found to vary a little. The three ventral sections were twenty-three, twenty-five and eight millimetres and the three dorsal sections twenty-two, eighteen and thirty-three millimetres.

A series of surfaces was thus exposed. For these a nomenclature has been adopted, based on the numerical order of the sections. The sections are numbered 1, 2, 3 and 4 in order from the median sagittal plane. Their surfaces are described as "medical (M)" and "lateral (L)." Thus "1 M." refers to the medial surface of the first section.

Description of Right (Dissected) Half of Pelvis.

Section 1 (see Figure II.) is cut practically in the midline. The *symphysis pubis* is cut and the sacrum and

FIGURE II.

Right half of pelvis with procidentia uteri cut in the median sagittal plane. The symphysis pubis and coccyx are cut through. The bladder, uterus and rectum and anal canal are cut. The urethra is split along its length. Note that the bladder and uterus are below a line drawn from the lower border of the symphysis pubis to the coccyx. The urethra is level with the top of the bladder cavity. The vagina forms the wall of the sac. The bowel does not enter into the procidentia. The bladder is stripped off the uterus.

coccyx are bisected. The urethra is cut along its length. The *cervix uteri* deviates a little to the right of the midline and the cervical canal lies to the right of the plane of section. The cavity of the uterus is laid open. The anal canal is cut in section.

It will be seen that the protruding mass is bounded by the vaginal walls. The anterior wall is entirely everted. The posterior wall is not entirely everted, a small portion of the lowest part, ten millimetres in length, remaining in direct relation with the anterior wall of the anal canal. In the sac formed by the vaginal walls lie the greater portion of the bladder and the whole of the uterus. There are two peritoneal pouches present. One, in front of the uterus, is the utero-vesical pouch. The other, behind the uterus, is the utero-rectal pouch or pouch of Douglas. These are both empty. The coils of small intestine do not descend into them, but rest above the bladder and the *fundus uteri.*

The bladder is entirely below a line joining the lower margin of the *symphysis pubis* to the tip of the coccyx. The most dependent part of the cavity of this viscus is that portion of the posterior wall which lies behind the ureteric bar or *torus uretericus.* The latter is particularly well defined. At its lateral extremity is the orifice of the ureter. This lies well below the line of the vulva and is actually right outside the body. The line of the ureter

FIGURE III.

The intestines have been removed from the pelvis. They did not descend into the sac which contains the uterus and bladder with their ligaments and ducts, bloodvessels and nerves. The peritoneum extends to the depths of the sac in front of and behind the uterus. The broad ligament is elongated and the infundibulo-pelvic fold and the uterine tube are seen along its upper border. Behind these is the elongated ovary, 43 millimetres long by 10 millimetres wide. The bladder has been hooked forward to display the utero-vesical pouch of peritoneum. The pouch of Douglas is empty.

FIGURE IV.

A flap of peritoneum has been removed from the pelvic wall posterior to the ovary and the loose connective tissue teased out. The obturator nerve and artery run forward above and below them is the obliterated umbilical (hypogastric) artery The uterine artery arises in common with the latter and runs down parallel with the ureter, but anterior to it, to the side of the uterus where it crosses the ureter. The ureter is sacculated at the pelvic brim. Behind the ureter note the thick neuro-vascular bundle.

has been projected on to the surface of the vaginal wall and its terminal part lies outside the vulva for a length of thirty-five millimetres and descends to the level of the lower border of the *labium majus*. The vesical orifice of the urethra lies about midway between the highest and lowest points of the bladder cavity. The urethra passes cranially for twenty-four millimetres and then curves at a sharp angle to open on the surface. The highest point of this curve is almost level with the highest point of the bladder cavity. Thus it is impossible for the patient to empty the bladder completely without manual assistance.

The posterior wall of the bladder has lost its relation to the anterior wall of the uterus and has been completely separated from it. There is a large triangular pouch of connective tissue between the bladder, the upper part of the anterior vaginal wall and the peritoneum at the site of the utero-vesical reflection of peritoneum.

FIGURE V.

The uterus has been drawn dorsally and the peritoneum has been opened on the lateral wall to show the terminal part of the ureter which crosses the uterus twenty millimetres below the cornu outside the abdomen. The vesical vessels are seen running forward from the neuro-vascular bundle. The pelvic fascia forms the lateral wall as seen in the openings in the peritoneum.

On removing the coils of intestine from the true pelvis (see Figure III.) the peritoneum is seen to descend into the depths of the protrusion in front of and behind the uterus. The lowest parts of the peritoneal cavity are the utero-vesical and utero-rectal pouches. The broad liga-

ment is elongated. The ovary is greatly elongated, measuring forty-three millimetres by ten millimetres at its widest part. The infundibulo-pelvic fold forms the highest part of the broad ligament. The round ligament is thin and attenuated.

The peritoneum has been opened by the reflection downwards of a rectangular flap (see Figure IV.). The loose extra-peritoneal connective tissue has been removed from the lateral wall of the pelvis from the brim of the pelvis minor to the junction of the lateral border of the uterus and the vagina. This has been carried forward on the pelvic wall to the obturator foramen and posteriorly to the spine of the ischium. Throughout this area the lateral wall of the pelvis has been completely exposed. It is seen to consist of the fascia covering the pelvic surface of the *obturator internus* muscle down to the white line of the pelvic fascia and below this of the fascia covering the

FIG. VI. (1 M.)

Medial surface of section I. It shows the same general features as Figure I. The levator ani muscle has been isolated from the tip of the coccyx to its attachment to the dorsal surface of the rectum and anal canal. Anterior to it are to be seen fibrous septa running from the anterior surface of the sacrum and coccyx to the bowel slinging it from the bone. There is dense pelvic connective tissue around the rectum. A probe lies in the ureterovesical orifice.

pelvic surface of the *levator ani* which has been elongated in a vertical plane. The obturator nerve and artery are seen passing forward to the obturator foramen and below these is the obliterated hypogastric artery which has in this specimen a fan-like expansion which is twelve millimetres in width below the obturator foramen.

The ureter crosses the external iliac vessels just anterior to their commencement. At this point it is dilated into a fusiform sac, thirty-five millimetres long by about twelve millimetres wide. It then tapers to its normal dimensions. The ureter runs downwards and forwards along the elongated pelvic wall till it reaches the lateral margin of the uterus, where it turns forward fifteen millimetres below the right uterine cornu and runs obliquely through the broad ligament (see Figure V.) passing in front of the plane of the anterior surface of the uterus twenty millimetres below the right cornu. It reaches the base of the bladder and passes through it obliquely.

FIG. VII. (2 M.)

Medial surface of second section. The procidentia is cut through near its left border (compare with Figure I.). The vagina is seen extroverted. The levator ani muscle may be traced both anteriorly and posteriorly. In front, its medial margin is attached to the wall of the vagina and has been carried down with it. Posteriorly it is attached to the rectal tissues. The ureter is seen in the parametric tissue. Dorsal to it, between the ureter and the levator ani, is the dense connective tissue of the neuro-vascular bundle, in which may be seen many vessels. The uro-genital diaphragm (triangular ligament) descends vertically below the pubis.

The total length of the pelvic ureter is one hundred and eighty millimetres.

The uterine artery is drawn out to a length of one hundred and forty millimetres. It arises from the anterior division of the hypogastric artery (see Figure IV.) at the point where the obliterated hypogastric trunk commences. It retains its relation to the ureter, crossing above it to reach the side of the uterus. But owing to the lengthening and stretching to which they have been subjected, the uterine artery and ureter run almost parallel till they cross one another at the lateral border of the uterus.

Immediately posterior to the artery and ureter is a broad band of dense connective tissue (see Figure V.) which is forty-five millimetres wide above and twenty millimetres wide below stretching from the pelvic wall above to the side of the uterus, vagina, bladder and rectum below. This mass consists of the leash of arteries, veins and nerves which are proceeding to the viscera from the hypogastric vascular trunks and the sacral plexus. They are bound

FIG. VIII. (2 M.)

This is the same as Figure VII., except that probes have been passed along the medial and lateral (id est superior and inferior) surfaces of the levator ani muscle. On the medial side is the pelvic connective tissue, in which is seen the ureter (probe in it) and dorsal to this is the tissue of the neuro-vascular bundle. To the lateral, id est inferior side, is to be seen the fatty tissue of the ischio-rectal fossa. The dense parametric tissue on the medial surface of the everted vagina is to be noted.

into one mass by a dense feltwork of connective tissue. This neuro-vascular bundle includes in it the ureter and the uterine artery as may be shown in the sections of the left half of the pelvis. It is firmly attached above and behind to the pelvic wall in an area corresponding to the lower part of the greater sciatic foramen, extending from the spine of the ischium to the side of the coccyx. It is a very definite mass of tissue and a finger may be passed round it between its lateral surface and the pelvic surface of the *levator ani.* A portion of this mass represents the elongated utero-sacral ligament. The vesical vessels may be seen running forward from the lower portion of this mass to the side of the bladder (see Figure V.) being disposed around the terminal portion of the ureter.

From an examination of the dissection it will be seen that the protruding mass contains the pelvic viscera (less the rectum) together with their vessels and nerves. The wall of the sac consists of three layers, an outer, the wall of the vagina, a middle, the *levator ani* muscle which is stretched and elongated, and an inner lining of peritoneum.

Description of the Left (Sectioned) Half of the Pelvis.

In order to obtain a clear idea of the distortion of the structures which normally constitute the pelvic floor we must examine the series of sections of the left half of the pelvis. The first section (see Figure VI.) shows the same outlines as the right half as far as the bladder and uterus are concerned. The pelvic connective tissue around the rectum is seen to be extensive and in it may be traced

FIG. IX. (3 M.)

This section lies close to the lateral bony wall of the pelvis. The superior and inferior rami of the pubis are seen with the obturator membrane between them. On the medial surface of the latter is the obturator internus muscle. Arising from its fascia is the levator ani muscle, which is attached dorsally to the lesser sciatic ligament. Inferior to the levator ani is the fatty tissue of the ischio-rectal fossa. Superior to it is the pelvic connective tissue. The ureter lies close under the peritoneum, half an inch behind the ovary.

layers of white fibrous tissue which fix the rectum directly to the anterior surface of the coccyx and the sacrum. These form a series of suspensory bands or ligaments suspending the bowel from the bony wall of the pelvis. This accounts for the fixity of the bowel in the pelvis while

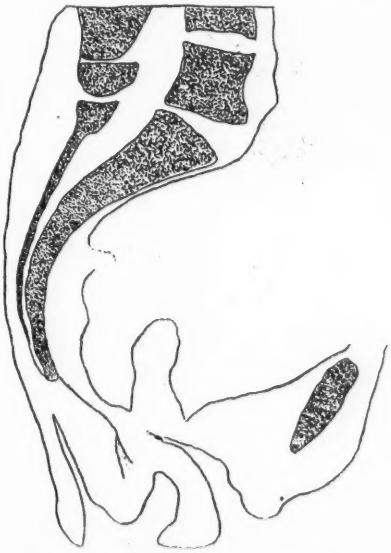

FIGURE X.

FIGURE XI.

the other viscera have sunk to a lower level. The cut edge of the *levator ani* muscle is seen descending almost vertically from the tip of the coccyx to its attachment to the dorsal wall of the anal canal.

In the next section (2 M.) the lateral wall of the prolapsed mass is seen in section (see Figures VII. and VIII.). The *levator ani* is cut in two places. Its lower border is firmly attached to the lateral wall of the vagina about twenty millimetres above the *labium minus*. The muscle itself is thin throughout its upper part and the muscle fibres are atrophied, but the lower border of the muscle is

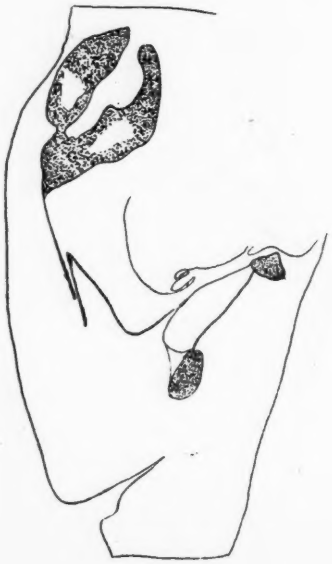

FIGURE XII.

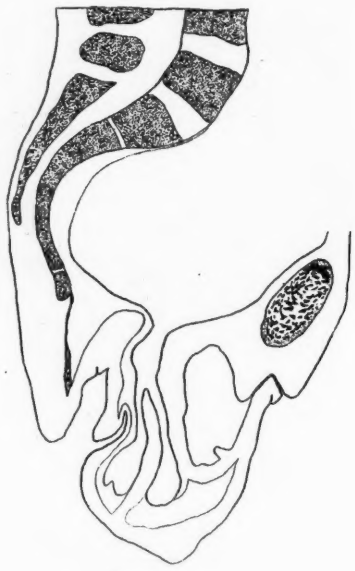

FIGURE XIII.

strong, thick and well defined. Probes have been passed along its medial and lateral surfaces (see Figure VIII.). To the medial side of the muscle is to be seen the pelvic connective tissue forming the parametrium and in this is embedded the ureter. Above and behind the ureter is the dense connective tissue forming the neuro-vascular bundle which was described in the right side of the dissection. In it are the openings of numerous vessels. The *levator ani* muscle is greatly elongated in a vertical direction. On its lateral surface posteriorly is the fatty tissue of the ischio-rectal fossa. This is of a different consistency and

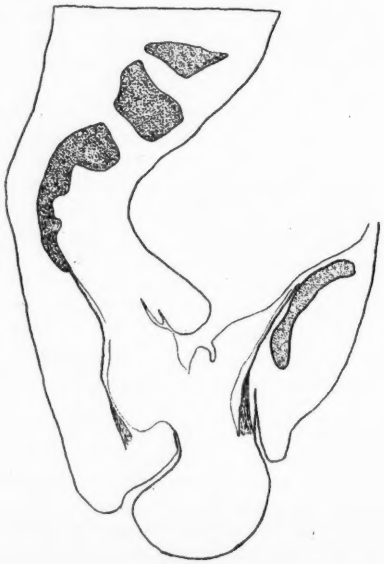

FIGURE XIV.

colour to the pelvic connective tissue which lies on its medial side. But anteriorly on its lateral surface there is to be seen the cut surface of the triangular ligament, now called the uro-genital diaphragm, which is descending almost vertically from the inferior border of the inferior ramus of the pubis. The *transversus perinei* muscle may be observed between the two layers of the uro-genital diaphragm and lateral to it again the bulb and the crus of the clitoris. It is to be specially noted that the uro-genital diaphragm, instead of running transversely as it does normally, is displaced downwards and outwards in a vertical plane.

In the third plane (see Figure IX.) the origin of the *levator ani* from the *arcus tendineus* over the pelvic surface of the *obturator internus* muscle may be noted, while posteriorly it may be traced to the lesser sacro-sciatic or sacro-spinous ligament. On its pelvic or superior surface there may be seen the neuro-vascular bundles which are running downwards and forwards to the uterus and the vagina, the rectum and the bladder. The ureter is lying immediately under the peritoneum twelve millimetres behind the site of the tube and ovary. The fat in the ischio-

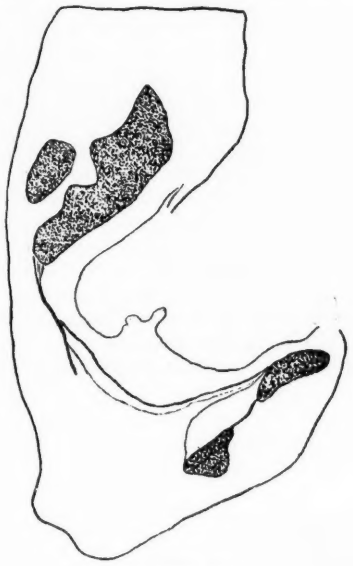

FIGURE XV.

rectal fossa is on the inferior aspect of the *levator ani* muscle.

Comparison of Sections with Sections of a Normal Pelvis.

In order to bring out the alterations in the pelvic floor resulting from prolapse a series of sagittal sections in approximately similar planes was made in a normal female pelvis. The measurements of this pelvis were:

Inter-spinous	250 millimetres
Inter-cristal	275 millimetres
Inter-trochanteric	300 millimetres

as far as could be judged in the cadaver. Thus it approximated in size to the specimen. The sections to the left side of the median plane are about fifteen millimetres in thickness. Tracings were then taken from both series on to sheets of glass with India ink and the tracings were

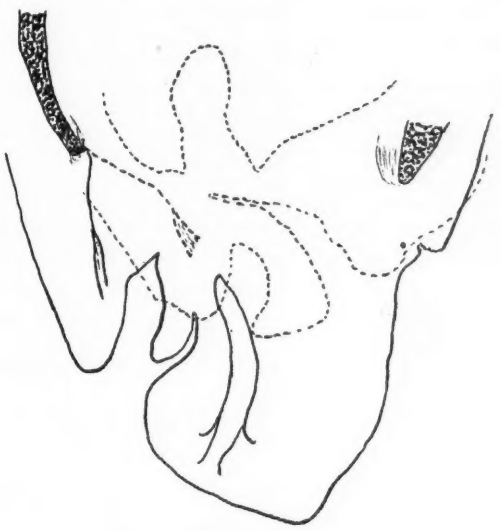

FIGURE XVI.

transferred also to paper ruled in millimetre squares. The *levator ani* muscle was marked in red, while outlines were drawn of the peritoneum, the skin surface and the bones. These are shown in Figures X., XI., and XII. for the normal pelvis and XIII., XIV. and XV. for the *procidentia*. The two series were then superimposed on the same sheets in Figures XVI., XVII. and XVIII., the normal pelvis being shown by broken lines and the *procidentia* by continuous lines. The glass plates have been mounted in frames at intervals corresponding to the thickness of the sections in order to give a perspective effect in viewing the structures. From these series two other Figures XIX. and XX. were drawn to show the alterations in the *levator ani*.

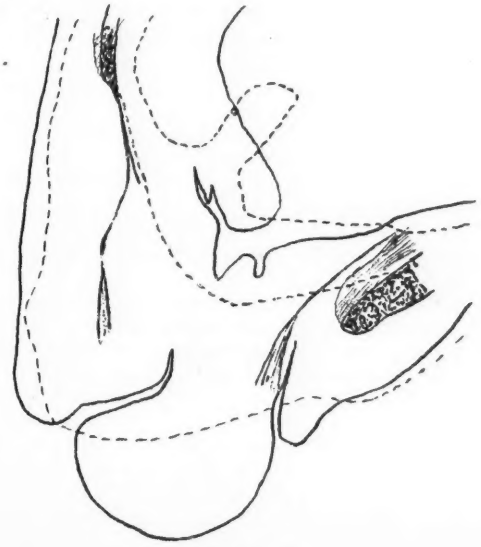

FIGURE XVII.

On examining these figures it will be noticed that there has been great stretching and lengthening of the *levator ani* muscle. The portion in the mid-line has been forced downwards and backwards from its normal oblique position to an almost vertical plane. Its distal margin has been displaced dorsally for thirty-five millimetres. With this the anal canal has been carried down and back to the same extent and so it lies much nearer the coccyx than in the normal position. This results in a lengthening of the anterior segment of the pelvic floor; but the rectum and anal canal have been shown to be slung from the anterior

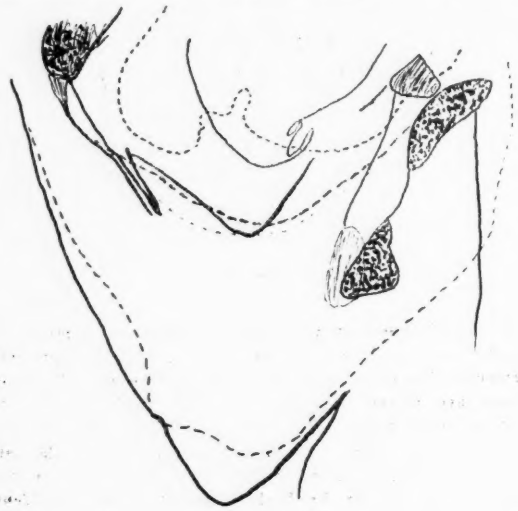

FIGURE XVIII.

aspect of the sacrum and coccyx. Consequently the new position is one of "swinging back" in the pelvis rather than "dropping down." The anal canal might be said to be retroposed rather than prolapsed. Actual measurements on the specimens show that in the normal pelvis the anal orifice is equidistant from the lower border of the *symphysis pubis* and the tip of the coccyx.

Anus to symphysis .. .. .. 75 millimetres
Anus to tip of coccyx .. .. .. 78 millimetres

In the *procidentia* it is found that the anus is removed from the symphysis in a dorsal direction.

Anus to symphysis .. .. .. 112 millimetres
Anus to tip of coccyx .. .. .. 76 millimetres

Thus the anus retains its distance relative to the coccyx, but it has receded thirty-seven millimetres from the symphysis.

The lower border of the *levator ani* posterior to the anal canal is displaced in a similar manner. Thus from the *symphysis* to the lower border of the *levator ani* at this spot the measurements are:

Normal pelvis .. .. 72 millimetres
Procidentia .. .. 107 millimetres

On examining the medial surface of the second section (Figure XV.) in the normal pelvis cut at a distance of twelve millimetres from the mid-line (because the section was cut three millimetres to the right of the mid-line and is fifteen millimetres thick), the *levator ani* is seen to form a complete antero-posterior floor for the pelvis. It descends at

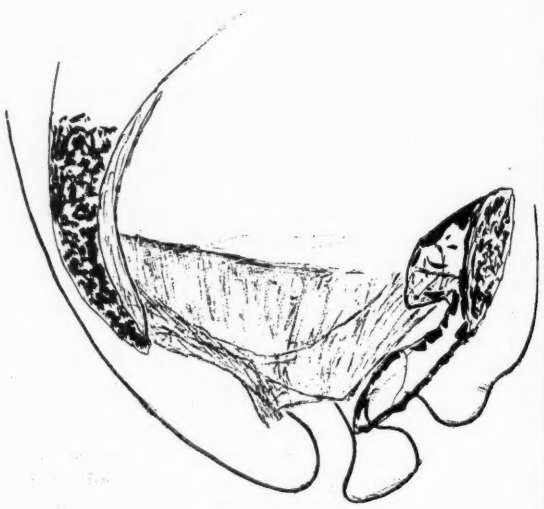

FIGURE XIX.

its lowest point twenty-five millimetres below a line drawn between the inferior border of the *symphysis pubis* and the coccyx and seven millimetres below a horizontal line drawn from the lower border of the *symphysis pubis*. In the *procidentia* the medial surface of the second section (2 M.) is twenty-three millimetres from the mid-line. Yet even though it is eleven millimetres further removed from the mid-line the *levator ani* does not form the floor of the pelvis (see Figures XIV. and XVII.). It has been forced laterally by the *procidentia* and its inferior (*id est* the medial) margin is everted and is at a distance of fifty millimetres below a line from the *symphysis* to the coccyx and thirty millimetres horizontally below the lower border of the *symphysis*. This amounts to a depression of twenty-three millimetres in the muscular floor of the pelvis

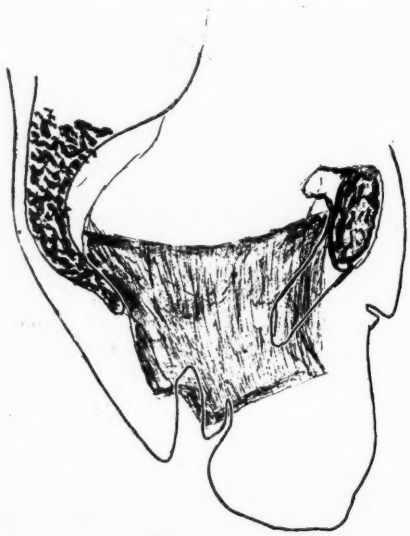

FIGURE XX.

at this point. Further, not only is this margin depressed, but it is seen to be forced out from the mid-line. It is estimated that this border is at its lowest point twenty-seven millimetres from the mid-line. This gives a space of fifty-four millimetres between the medial borders of the everted *levatores ani*. So that the space between the muscle borders, the pubis and the posterior wall of the rectum, instead of being a space with parallel antero-posterior walls about twenty millimetres wide and about seventy-two millimetres long is an oval space fifty-four millimetres wide at its widest part and about one hundred and seven millimetres long.

In the normal pelvis this space is filled and supported by the strong and thick structures of the triangular ligament or uro-genital diaphragm, consisting of two layers of fascia and the *transversus perinei* and *compressor urethrae* muscles. It forms a strong band five millimetres in thickness and runs horizontally between the inferior borders of the *pubis rami*. The bulb and the crus of the clitoris are attached to its inferior surface and it is of course pierced by the vagina and urethra. In the *procidentia* the uro-genital diaphragm has been as it were split in half. The diaphragm can be seen in section 2 M. (Figure VIII.) running vertically below the ramus of the pubis into the *labium majus* just at the vaginal orifice. It has been folded back like one half of a double folding door and now is in the same plane as the passage instead of at a right angle to it. This weakens still further the anterior portion of the pelvic floor.

Summary and Conclusions.

1. In *procidentia* the protruding mass consists of a sac containing the bladder and uterus together with their vascular and nervous supply, ligaments and ducts. The wall of the sac is the extroverted vagina. The sac is lined with peritoneum.

2. The bladder and uterus are below a line drawn from the inferior border of the *symphysis pubis* to the tip of the coccyx. The urethral orifice is on the same level as the top of the bladder.

3. The ureter is lengthened and its distal end is outside the vulvar ring for a length of thirty-five millimetres.

4. The bladder is stripped off the anterior wall of the uterus.

5. The rectum does not enter into the *procidentia* because it is slung to the anterior aspect of the sacrum by a series of obliquely placed fibrous septa.

6. The anal canal is displaced dorsally for about thirty-seven millimetres and lies further from the pubes instead of in its normal position about midway between pubes and coccyx.

7. The neuro-vascular bundles are greatly elongated but retain their attachments to the pelvic wall and viscera.

8. The uro-genital diaphragm is displaced downwards and comes to lie almost vertically below the inferior rami of the pubes.

9. The *levatores ani* undergo several changes:

(a) They retain their attachments to the pelvic walls,
(b) They are greatly stretched and elongated,
(c) Throughout the greater part of their extent they are thin and membranous, the muscle tissue having atrophied,
(d) Their inferior borders remain thick and strong,
(e) Their medial margins are widely separated but retain their attachments to the lateral vaginal wall,
(f) Their junction behind the rectum is displaced dorsally and comes to lie almost vertically below the tip of the coccyx,
(g) The hiatus between the medial margins of the muscles is thus greatly widened and lengthened; in the normal pelvis its length is seventy-two millimetres and its width twenty millimetres, in *procidentia* its length is one hundred and seven millimetres and its width fifty-four millimetres.

10. As a result of 8 and 9 the pelvic floor is opened and the viscera—uterus, vagina and bladder—fall through the gap.

11. The pelvic floor as a whole is at the same time displaced downwards.

Dr. Ralph Worrall said that it was a great demonstration of anatomical points of great clinical importance. The uterus was small as it so often was in *procidentia* and it suggested that text book statements that weight and size of the uterus were factors in the production of prolapse were erroneous. The rectum had not descended. What was called rectocele was simply vaginal prolapse from above downwards. True rectocele was a different proposition and of different pathology; in it the posterior vaginal wall was sealed to the rectum by inflammatory adhesions following an infected tear in the perineum.

Separation and lateral retraction of the *levatores ani* were well seen. He was in the habit of gauging this lateral retraction before operation with a finger in the vagina and thumb at the *ostium*, in order to get a clear conception of the extent to which he had to disinter these buried structures and bring them together again medially. It was not, of course, possible to attack the median margins behind the rectum, but results proved that reunion anterior to the rectum served the required purpose.

The specimens proved that prolapse of the uterus was a misnomer. The condition was really one of hernia of the entire displaceable portions of the pelvic contents, as Berry Hart had first shown in frozen sections. Dr. Maguire's sections proved that the so-called fixed portions also moved downwards and backwards. The main support of the pelvic contents was the mass of fibro-muscular bundles between the vaginal vault and the peritoneum, and these were most dense where the vessels and nerves traversed the pelvis. In performing the Wertheim operation after cutting through the round, utero-sacral and broad ligaments, after dissecting the bladder completely down in front and the rectum behind, one could not pull up the uterus and vagina fully, so as to allow of the application of the vaginal clamp, until one had defined, ligatured and cut dense bands on each side, the cervico-pelvic bands of Victor Bonney. After dividing these bands the rest of the task was easy.

The bands could not be differentiated in the sections because they merged into the total mass of fibro-muscular tissue. Applying the knowledge gained by the demonstration he, Dr. Worrall, concentrated on the restoration of the supporting structures in the pelvic floor and considered the abdominal work of secondary importance. Any simple round ligament operation would suffice to place the uterus at right angles to the vagina, so that its posterior surface should be exposed to intra-abdominal pressure, but no abdominal operation, however radical, would cure prolapse unless the fibro-muscular tissue was again shortened and brought together in front of the cervix and the fascia with the *levatores ani* re-united in the mid-line.